

Procedure for the pressure testing of calibration sources with the LBL pressure vessel.

We have constructed and tested two simple pressure testing chambers for KamLAND calibration sources. Each vessel is a 304 stainless steel commercial pressure vessel with a maximum working pressure of 140 psi. (9.65 bar). The pressure vessel is pressurized with a hand pump through a Schrader valve. The relief valve on the vessel is set at 75 psi. (5.17 bar). These vessels were tested and held pressure at 45 psi (3.1 bar) for 15 hours. One pressure tester will be kept in Berkeley, the other will be sent to Mozumi for use in the mine. The proposed testing procedure for sources is given below.

Initial conditions:

The initial state of the pressure testing vessel should be un-pressurized and clean.

Testing of a source:

1. Place the calibration source in a beaker or other container of scintillator (or mineral oil only if desired) that will fit into the pressure chamber opening. It is desirable to have a secondary containment like a beaker to keep from filling the pressure tank itself with scintillator, which would be difficult to clean. All calibration sources should be negatively buoyant. The scintillator should cover the calibration source.
2. Place the beaker with the calibration source into the pressure vessel and install the vessel lid/door.
3. Attach the pump to the Schrader valve and inflate the tank with air until the desired pressure is reached. The pressure can be read on the pressure gauge on the vessel. *The depth of scintillator in the detector from the surface to the bottom of the balloon is approximately 17 meters. The scintillator density is approximately 0.87. This corresponds to a pressure at the bottom of the balloon of approximately 21 psi. (1.45 bar). It is prudent to test to a greater pressure than the maximum pressure that the calibration sources will see. I propose testing to a pressure of 1.5 times the maximum working pressure (the pressure at the bottom of the balloon). This gives a test pressure of  $1.5 \times 21 \text{ psi.} = 31.5 \text{ psi. (2.17 bar)}$ .*
4. Allow the calibration source to sit at pressure for 30 minutes. Release the pressure by pulling up on the ring at the top of the pressure relief valve. Wait 5 minutes. Re-pressurize the vessel to the test pressure. Repeat this procedure 5 times. After pressurizing for the 5<sup>th</sup> time, let the vessel remain at pressure over night or for 12 hours.
5. Release the pressure, open the pressure vessel, remove the calibration source and examine the source for leaks. If desired, the scintillator in which the source was immersed could be checked for contamination.
6. Re-install the lid of the pressure vessel to prevent contamination.